

Collision Theory

- Q1** Use your knowledge of reaction rates to fill in the blanks below. Then put the correct labels on the diagrams.

Fill the blank words (use more than once)

moderate surface area faster
collide particles catalyst collision
theory concentration energymore
often successful collision

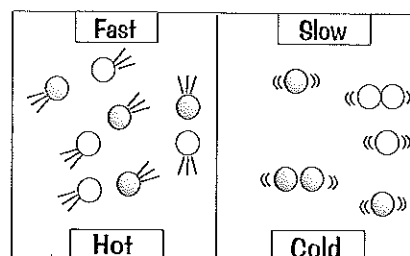
Diagram labels

FAST SLOW HIGH CONCENTRATION
LOW CONCENTRATION LARGE
SURFACE AREA CATALYST PRESENT

Particles can only react if they _____ with enough _____ for the reaction to take place. This is called the _____. There are four factors that can change the rate of a chemical reaction; temperature, _____, surface area and the use of a suitable _____.

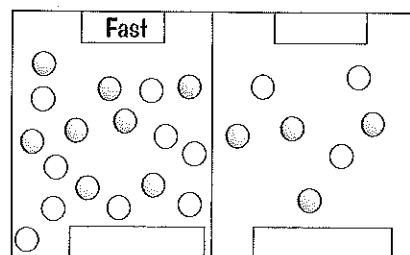
Temperature

Increasing the temperature will cause the particles to move _____, with more energy. They will therefore collide _____ and with greater _____. These two things mean there are more successful collisions per second and therefore a _____ rate of reaction.



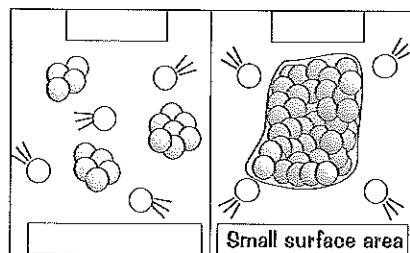
Concentration

Increasing the concentration of a reactant simply means there are more _____ which may collide and so react. More collisions means a _____ reaction.



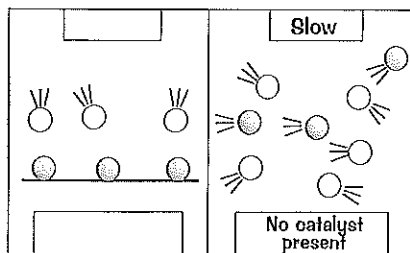
Surface Area

Using a powder instead of a lump means the _____ is greater, which means a greater area of reactant is exposed and so available for a collision. More collisions means a _____ reaction.



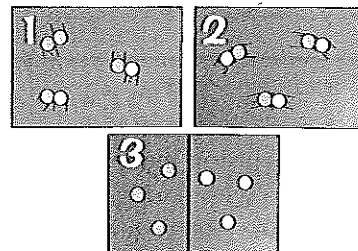
Catalysts

Use of a suitable catalyst means that the particles may react even if they collide with only _____ energy. This means more _____ collisions are likely. Some catalysts work because one of the particles is fixed to a surface. This makes the chance of a _____ more likely. More collisions means a _____ reaction.



- Q2** Match the three descriptions below to these three diagrams:

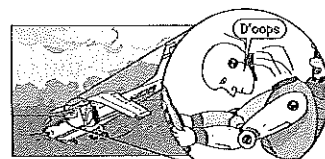
- The particles brush past each other and collide only gently.
- The particles are separated by a barrier and do not collide.
- The particles collide energetically with each other.



Collision Theory

Q3 Choose the sentence that best describes the collision theory:

- Particles collide at random and always react.
- Collisions between particles often result in a reaction.
- Reacting particles must collide with enough energy in order to react.
- Collisions between molecules are sometimes needed before a reaction occurs.



Collision Theory 2:
It's not the falling that hurts, it's the landing.

Q4 Four factors may have an effect on the rate of reaction.

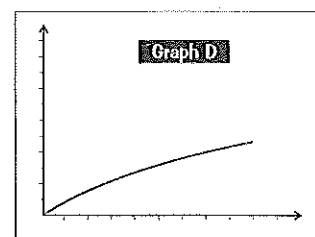
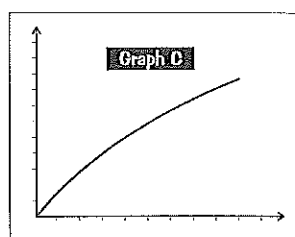
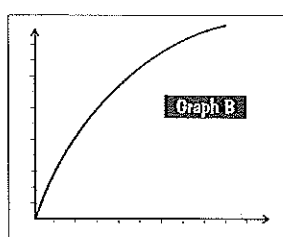
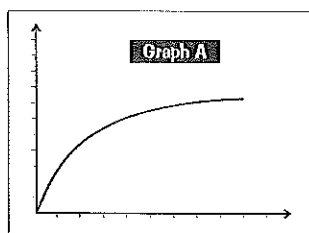
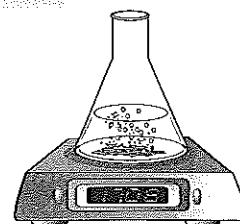
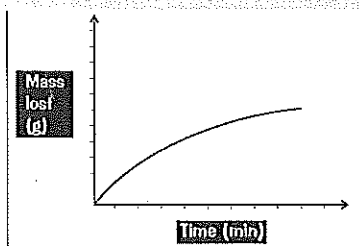
Match each one with the explanation of how it works.

Factors	Explanations
Temperature	There are more particles to collide
Concentration	There is a bigger area for other particles to collide with
Catalyst	Particles move faster and so there are more collisions and collisions have more energy
Surface area	The reaction needs less energy to happen

Q5 This apparatus may be used to investigate the reaction between marble chips and dilute hydrochloric acid. Some marble chips are left unreacted at the end.

A graph showing the results from such an experiment is shown on the right.

Here are four other graphs plotted to the same scale:



- Referring to the original graph, match each of the graphs A-D with the correct description:
 - the same volume of acid but twice as concentrated.
 - the same concentration of acid but twice the volume.
 - the same mass of marble chips but smaller chips.
 - the same volume and concentration of ice-cold acid.
- Use the theory of collisions to explain each of your answers to parts i) → iv).

Top Tips:

This collision theory stuff is what I call **real science** — and it makes sense — things only react if they collide with enough speed — anything that increases their **speed** or **number of collisions** will increase the rate. Make sure you know how it applies to **temperature**, **concentration**, **surface area** and **catalysts**.